

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023

DQT5614 – QUANTITATIVE TECHNIQUES

(for diploma students only)

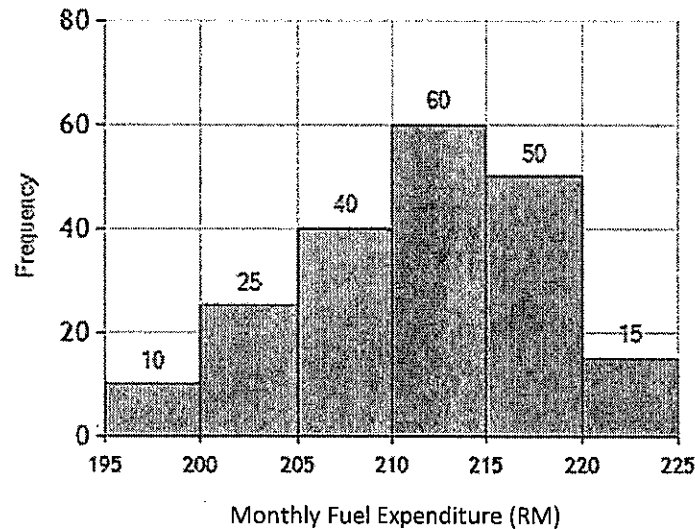
10 JULY 2023
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 3 pages excluding appendix.
2. Attempt **ALL** questions. The distribution of the marks for each question is given.
3. Write all your answer in the Answer Booklet provided.
4. Key formulae are given in the Appendix.

QUESTION 1

- a) The following frequency histogram shows the monthly fuel expenditure (in RM) of 200 diploma students.



- Construct a grouped data table for the above histogram. (4 marks)
 - Using the grouped data table in (i), calculate the sample mean and standard deviation for the monthly fuel expenditure. (7 marks)
- b) Given TWO data sets on the amount of fuel expenditure by countries in Asia and Europe.

Europe (USD)	Asia (USD)
1,118	2,727
2,706	706
1,952	4,423
2,245	311
2,727	638
2,664	1,118
1,108	925
1,305	1,664
2,138	612
1,617	884
1,991	2,950
1,471	612

- Determine the measure of center for each set of data above. (12 marks)
- Based on (i), what is the shape of distribution for food expenditure among the countries in Europe? (2 marks)

[TOTAL: 25 MARKS]

Continued...

QUESTION 2

- a) In one of the Domino Pizza outlets, it was found that 42% of their customers prefer to dine-in and the remaining prefer to take away. In a month-long observation, 78% of the dine-in customers and 84% of the take away customers prefer to pay for their meal by cash compared to paying by cards.
- Construct a tree diagram that represent the above situation. (3 marks)
 - Find the probability of a customer who does not prefer to pay by cash. (3 marks)
- b) The contingency table below shows the part time job preferences according to gender among university students. One student is selected at random.

		Part time job preferences			
		Tutor (T)	Food runner (D)	Receptionist (R)	Total
Gender	Male (M)	a	20	d	48
	Female (F)	21	c	27	e
	Total	b	44	40	120

- Complete the table by finding the value of a , b , c , d and e . (5 marks)
- Find the probability of a female student who prefers food runner as her part time job. (2 marks)
- What is the percentage that the student prefers a tutor or receptionist as a part time job? (4 marks)
- Calculate the probability of selecting a male student, given that he prefers tutor as a part time job. (3 marks)

[TOTAL: 20 MARKS]**QUESTION 3**

- a) On average, the training hours for a new hired staff in X company is found to be 125 hours in one month. A random sample of 35 staff has been selected with a population variance of 36 hours. Test the claim at 5% significance level, if the training hours is less than 127 hours in one month. Assume the data is approximately normal. (10 marks)

Continued...

- b) A consumer institution claims that there is a difference in the mean credit card debt between males and females in Malaysia. The results from a random survey of 100 individuals from each group are shown below.

Males	Females
$\bar{x}_1 = \text{RM } 700$	$\bar{x}_2 = \text{RM } 650$
$S_1 = \text{RM } 450$	$S_2 = \text{RM } 420$

- Compute the value of test-statistics. (3 marks)
 - What is the p -value? (2 marks)
 - Do the results support the institution's claim at 10% significance level? (3 marks)
- c) A survey conducted by a group of diploma students claims that more than 85% of the students agree to visit the turtle conservation center for their community service project. The results of the survey has been recorded as follows:

Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Test the claim at 10% significance level. (12 marks)

[TOTAL: 30 MARKS]

QUESTION 4

Master Thalapaty wants to show his students that there is a linear correlation between the number of hours spent on social media in one week and their exam scores taken on the following week. The number of hours spent and exam scores for eight randomly selected students are shown in the following table.

Hours spent on social media	15	60	17	62	23	61	37	55
Exam scores	87	51	80	50	72	45	Q	60

Given that: $\Sigma x = 330$, $\Sigma y = 510$, $\Sigma xy = 18931$, $\Sigma x^2 = 16602$, $\Sigma y^2 = 34104$

- Identify the value of Q . (1 mark)
- State the independent and dependent variable. (2 marks)
- Find the linear regression equation $\hat{y} = \beta_0 + \beta_1 x$. (12 marks)
- Predict the exam score if the student spends 50 hours on social media. (2 marks)
- Compute the correlation coefficient, r and interpret the answer. (4 marks)
- Compute the value of SST , SSR and SSE . (4 marks)

[TOTAL: 25 MARKS]

End of Paper.

APPENDIX – KEY FORMULA

	Ungrouped Data	Grouped Data
Mean	$\bar{x} = \frac{\sum x_i}{n}$ where n : sample size	$\bar{x} = \frac{\sum m_i f_i}{\sum f_i}$ where m : class midpoint f : class frequency
Variance	$s^2 = \frac{1}{n-1} \left[\sum x_i^2 - \frac{(\sum x_i)^2}{n} \right]$ where n : sample size	$s^2 = \frac{1}{(\sum f_i) - 1} \left[\sum m_i^2 f_i - \frac{(\sum m_i f_i)^2}{\sum f_i} \right]$ where m : class midpoint f : class frequency

NORMAL AND STANDARD NORMAL PROBABILITY DISTRIBUTION

- z-value (observed value) for an x value : $Z = \frac{x - \mu}{\sigma}$

HYPOTHESIS TESTING

Population	Mean	Proportion
1	$Z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$	$Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \text{ where } \hat{p} = \frac{x}{n}$
2	$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$	$Z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\hat{p}_p(1-\hat{p}_p)} \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$ where $\hat{p}_p = \frac{x_1 + x_2}{n_1 + n_2}$

LINEAR REGRESSION ANALYSIS

- **Least square regression equation**, $\hat{y} = \beta_0 + \beta_1 x$ where $\beta_1 = \frac{S_{xy}}{S_{xx}}$ and $\beta_0 = \bar{y} - \beta_1 \bar{x}$
- **Correlation coefficient**, $r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}}$ where

$S_{xx} = \sum x^2 - \frac{(\sum x)^2}{n}$	$S_{yy} = \sum y^2 - \frac{(\sum y)^2}{n}$	$S_{xy} = \sum xy - \frac{(\sum x)(\sum y)}{n}$
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- **Sum of Square**

$SST = SSR + SSE$	$SST = S_{yy}$	$SSR = \frac{(S_{xy})^2}{S_{xx}}$
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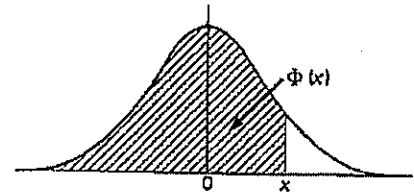
- **Test of Significance for Regression Slope**

Standard Error, $s_e = \sqrt{\frac{SSE}{n-2}}$	Regression t-Test $t = \frac{\beta_1}{s_e / \sqrt{S_{xx}}}$	Correlation t-Test $t = r \cdot \sqrt{\frac{n-2}{1-r^2}}$
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TABLE 4. THE NORMAL DISTRIBUTION FUNCTION

The function tabulated is $\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^x e^{-t^2/2} dt$. $\Phi(x)$ is

the probability that a random variable, normally distributed with zero mean and unit variance, will be less than or equal to x . When $x < 0$ use $\Phi(x) = 1 - \Phi(-x)$, as the normal distribution with zero mean and unit variance is symmetric about zero.



x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$
0.00	0.5000	0.40	0.6554	0.80	0.7881	1.20	0.8849	1.60	0.9452	2.00	0.97725
0.01	5040	0.41	6591	0.81	7910	1.21	8869	1.61	9463	2.01	97778
0.02	5080	0.42	6628	0.82	7939	1.22	8888	1.62	9474	2.02	97831
0.03	5120	0.43	6664	0.83	7967	1.23	8907	1.63	9484	2.03	97882
0.04	5160	0.44	6700	0.84	7995	1.24	8925	1.64	9495	2.04	97932
0.05	5199	0.45	6736	0.85	8023	1.25	8944	1.65	9505	2.05	97982
0.06	5239	0.46	6772	0.86	8051	1.26	8962	1.66	9515	2.06	98030
0.07	5279	0.47	6808	0.87	8078	1.27	8980	1.67	9525	2.07	98077
0.08	5319	0.48	6844	0.88	8106	1.28	8997	1.68	9535	2.08	98124
0.09	5359	0.49	6879	0.89	8133	1.29	9015	1.69	9545	2.09	98169
0.10	5398	0.50	6915	0.90	8159	1.30	9032	1.70	9554	2.10	98214
0.11	5438	0.51	6950	0.91	8186	1.31	9049	1.71	9564	2.11	98257
0.12	5478	0.52	6985	0.92	8212	1.32	9066	1.72	9573	2.12	98300
0.13	5517	0.53	7019	0.93	8238	1.33	9082	1.73	9582	2.13	98341
0.14	5557	0.54	7054	0.94	8264	1.34	9099	1.74	9591	2.14	98382
0.15	5596	0.55	7088	0.95	8289	1.35	9115	1.75	9599	2.15	98422
0.16	5636	0.56	7123	0.96	8315	1.36	9131	1.76	9608	2.16	98461
0.17	5675	0.57	7157	0.97	8340	1.37	9147	1.77	9616	2.17	98500
0.18	5714	0.58	7190	0.98	8365	1.38	9162	1.78	9625	2.18	98537
0.19	5753	0.59	7224	0.99	8389	1.39	9177	1.79	9633	2.19	98574
0.20	5793	0.60	7257	1.00	8413	1.40	9192	1.80	9641	2.20	98610
0.21	5832	0.61	7291	1.01	8438	1.41	9207	1.81	9649	2.21	98645
0.22	5871	0.62	7324	1.02	8461	1.42	9222	1.82	9656	2.22	98679
0.23	5910	0.63	7357	1.03	8485	1.43	9236	1.83	9664	2.23	98713
0.24	5948	0.64	7389	1.04	8508	1.44	9251	1.84	9671	2.24	98745
0.25	5987	0.65	7422	1.05	8531	1.45	9265	1.85	9678	2.25	98778
0.26	6026	0.66	7454	1.06	8554	1.46	9279	1.86	9686	2.26	98809
0.27	6064	0.67	7486	1.07	8577	1.47	9292	1.87	9693	2.27	98840
0.28	6103	0.68	7517	1.08	8599	1.48	9306	1.88	9699	2.28	98870
0.29	6141	0.69	7549	1.09	8621	1.49	9319	1.89	9706	2.29	98899
0.30	6179	0.70	7580	1.10	8643	1.50	9332	1.90	9713	2.30	98928
0.31	6217	0.71	7611	1.11	8665	1.51	9345	1.91	9719	2.31	98956
0.32	6255	0.72	7642	1.12	8686	1.52	9357	1.92	9726	2.32	98983
0.33	6293	0.73	7673	1.13	8708	1.53	9370	1.93	9732	2.33	99010
0.34	6331	0.74	7704	1.14	8729	1.54	9382	1.94	9738	2.34	99036
0.35	6368	0.75	7734	1.15	8749	1.55	9394	1.95	9744	2.35	99061
0.36	6406	0.76	7764	1.16	8770	1.56	9406	1.96	9750	2.36	99086
0.37	6443	0.77	7794	1.17	8790	1.57	9418	1.97	9756	2.37	99111
0.38	6480	0.78	7823	1.18	8810	1.58	9429	1.98	9761	2.38	99134
0.39	6517	0.79	7852	1.19	8830	1.59	9441	1.99	9767	2.39	99158

TABLE 4. THE NORMAL DISTRIBUTION FUNCTION

z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$
2.40	0.99180	2.55	0.99461	2.70	0.99653	2.85	0.99781	3.00	0.99865	3.15	0.99918
.41	.99202	.56	.99477	.71	.99664	.86	.99788	.01	.99869	.16	.99921
.42	.99224	.57	.99492	.72	.99674	.87	.99795	.02	.99874	.17	.99924
.43	.99245	.58	.99506	.73	.99683	.88	.99801	.03	.99878	.18	.99926
.44	.99266	.59	.99520	.74	.99693	.89	.99807	.04	.99882	.19	.99929
2.45	0.99286	2.60	0.99534	2.75	0.99702	2.90	0.99813	3.05	0.99886	3.20	0.99931
.46	.99305	.61	.99547	.76	.99711	.91	.99819	.06	.99889	.21	.99934
.47	.99324	.62	.99560	.77	.99720	.92	.99825	.07	.99893	.22	.99936
.48	.99343	.63	.99573	.78	.99728	.93	.99831	.08	.99896	.23	.99938
.49	.99361	.64	.99585	.79	.99736	.94	.99836	.09	.99900	.24	.99940
2.50	0.99379	2.65	0.99598	2.80	0.99744	2.95	0.99841	3.10	0.99903	3.25	0.99942
.51	.99396	.66	.99609	.81	.99752	.96	.99846	.11	.99906	.26	.99944
.52	.99413	.67	.99621	.82	.99760	.97	.99851	.12	.99910	.27	.99946
.53	.99430	.68	.99632	.83	.99767	.98	.99856	.13	.99913	.28	.99948
.54	.99446	.69	.99643	.84	.99774	.99	.99861	.14	.99916	.29	.99950
2.55	0.99461	2.70	0.99653	2.85	0.99781	3.00	0.99865	3.15	0.99918	3.30	0.99952

The critical table below gives on the left the range of values of z for which $\Phi(z)$ takes the value on the right, correct to the last figure given; in critical cases, take the upper of the two values of $\Phi(z)$ indicated.

3.075	0.9990	3.263	0.9994	3.731	0.99990	3.916	0.99995
3.105	0.9990	3.320	0.9995	3.759	0.99991	3.976	0.99996
3.138	0.9991	3.389	0.9996	3.791	0.99992	4.055	0.99997
3.174	0.9992	3.480	0.9997	3.826	0.99993	4.173	0.99998
3.215	0.9993	3.615	0.9998	3.867	0.99994	4.417	0.99999
	0.9994		0.9999		0.99995		1.00000

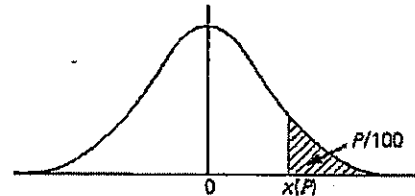
When $z > 3.3$ the formula $1 - \Phi(z) \div \frac{e^{-z^2}}{z\sqrt{2\pi}} \left[1 - \frac{1}{z^2} + \frac{3}{z^4} - \frac{15}{z^6} + \frac{105}{z^8} \right]$ is very accurate, with relative error less than $945/z^{10}$.

TABLE 5. PERCENTAGE POINTS OF THE NORMAL DISTRIBUTION

This table gives percentage points $z(P)$ defined by the equation

$$\frac{P}{100} = \frac{1}{\sqrt{2\pi}} \int_{z(P)}^{\infty} e^{-t^2/2} dt.$$

If X is a variable, normally distributed with zero mean and unit variance, $P/100$ is the probability that $X \geq z(P)$. The lower P per cent points are given by symmetry as $-z(P)$, and the probability that $|X| \geq z(P)$ is $2P/100$.



P	$z(P)$	P	$z(P)$	P	$z(P)$	P	$z(P)$	P	$z(P)$	P	$z(P)$
50	0.0000	5.0	1.6449	3.0	1.8808	2.0	2.0537	1.0	2.3263	0.10	3.0902
45	0.1257	4.8	1.6646	2.9	1.8957	1.9	2.0749	0.9	2.3656	0.09	3.1214
40	0.2533	4.6	1.6849	2.8	1.9110	1.8	2.0969	0.8	2.4089	0.08	3.1559
35	0.3853	4.4	1.7060	2.7	1.9268	1.7	2.1201	0.7	2.4573	0.07	3.1947
30	0.5244	4.2	1.7279	2.6	1.9431	1.6	2.1444	0.6	2.5121	0.06	3.2389
25	0.6745	4.0	1.7507	2.5	1.9600	1.5	2.1701	0.5	2.5758	0.05	3.2905
20	0.8416	3.8	1.7744	2.4	1.9774	1.4	2.1973	0.4	2.6521	0.04	3.7190
15	1.0364	3.6	1.7991	2.3	1.9954	1.3	2.2262	0.3	2.7478	0.03	3.8906
10	1.2816	3.4	1.8250	2.2	2.0141	1.2	2.2571	0.2	2.8782	0.02	4.2649
5	1.6449	3.2	1.8522	2.1	2.0335	1.1	2.2904	0.1	3.0902	0.01	4.4172